A METHOD AND SYSTEM FOR SUBSCRIBER INTEGRITY IN A MOBILE
COMMUNICATIONS SYSTEM.

Technical field of the invention

The invention relates to the field of mobile
telephony and more particularly to the field of protecting
the integrity of subscribers, in relation to a location
based service client used in a process of positioning a
mobile terminal.

Background of the invention

A system for mobile positioning enables a mobile
network operator to provide location-based services to its
customers. Positioning is the process of geographically
locating mobile stations (MS) in a Public Land Mobile
Network (PLMN) by collecting and analyzing needed
information. The position is calculated and reported to an
application for further usage. Location information is an
important enabler for many of the new services in the third
generation mobile networks. In some countries there are
also legal requirements on providing location information
when for example an emergency call is made from a mobile
station.

The knowledge of the location of a mobile station or
entity opens up a new set of applications and enhance
existing ones. A number of different applications in
different fields, such as governmental, operators or
commercial applications are and will be provided.

Each target group has its own demands and needs
concerning location based services. For example,
governmental use is applicable for public welfare such as
emergency calls and infrastructure planning.

Depending on the type of application it can be run
either by an operator or a service provider. The operator
is able to offer service providers access to location

information, and the operator can also run its own
applications. Existing services can be greatly enhanced and
new services can be developed, with the knowledge of the
geographical position of a mobile entity.

5   A location based services client (LCS-C) is often a
service provider outside the control of the mobile network
operator. Since a subscriber usually has a looser
relationship with the service provider than with its mobile
network operator the issue of trust and confidence of what

10   its position can be used for is an obstacle for some
location based services. The lack of user integrity in
prior art systems is a problem, both with respect to the
party utilizing the LCS for positioning and the party being
positioned.

15   Another problem is that in many countries it is
prohibited - due to legislation and regulation - to
distribute position data of a user without the user's
consent.

        No prior art system or method solves this problem in

20   the current PLMNs. There are however proposals, all of
which depend on new network features or protocols.

        WO-01/99463 discloses a method and system for
integrity positioning of a mobile station. A subscriber in
a communication network connects to a homepage or portal of

25   a service provider supplying positioning services in an
open computer network such as the Internet. The subscriber
specifies the subscriber number of his mobile station in
order to obtain the positioning service. Hence, the
subscriber is no longer anonymous with respect to the

30   service provider.

        WO-02/49380 discloses mobile positioning using
encrypted ID. The user connects to the positioning service
provider via the Internet. Thus, the anonymity is at the
same level as on the Internet. Also, it is limited to

35   mobile internet access - and not usable for voice/sms

access to the service.

The first time the user accesses a specific
positioning service provider, he is directed back to his
operator and is required to register himself by entering
5   his phone number. The registration is authenticated via an
SMS-code-return procedure. The operator creates an own
alias which is sent to the positioning service provider.
The user's real identity never leaves the operator domain.

A drawback of the proposed solution is that it
10   requires implementation in the LCS Client and the SMS-C. A
new node and an Alias Server, for handling the aliases, are
also required and new protocols are needed between the
nodes.

Further, WO-0249380 only covers the case when a user
15   utilizes a positioning service for positioning himself.
Additional administration is also required since there are
three lists that contains more or less the user identity,
but with different forms of encryption (aliases).

Common drawbacks for these prior art systems are that
20   the subscriber has to access the service via the Internet.
This means that the user access a service providers
homepage on the Internet and initiates the service. Thus,
no triggering/access of the service is provided from the
telecom domain, for example SMS/MMS or voice.

25   Moreover, the prior art only concerns the anonymity
of the requesting subscriber. It does not take into account
the anonymity of one or several requested parties, who may
be different from the requesting party. Further, the LCS
Client and/or the user terminal is required to participate
30   in the anonymity method.

Summary of the present invention

The objective of the invention is to provide a method
for protecting the integrity of subscribers in relation to
35   a location based service client used in a process of

positioning a mobile terminal, with respect to both the
subscriber requesting a positioning of the mobile terminal
and a subscriber of the mobile terminal to be positioned.

In order to achieve said object the invention pro-
5   vides a method characterised by the steps of:

assigning an alias identity for an entity initiating
a positioning request and/or for a subscriber associated
with said mobile terminal to be positioned,

storing said alias identity for said entity and/or
10   for the subscriber in association with the subscriber
number of said entity and the subscriber, respectively,

receiving a positioning request from said location
based service client for said subscriber, said request
including said alias identity for said subscriber,

15   looking up the number matching said alias identity
for said subscriber,

performing a positioning request for said mobile
terminal in an associated network,

sending a response including location information
20   received from said network and said alias identity to said
location based service client.

The invention also provides a system comprising means
for working the method, which is characterised by a gateway
mobile location centre adapted to:

25   receive a request for an alias identity for an entity
initiating a positioning request and/or for a subscriber
associated with said mobile terminal to be positioned,

assign an alias identity for said entity and/or for
said subscriber,

30   store said alias identity for said entity and/or for
said subscriber in association with the subscriber number
of said entity and said subscriber, respectively,

receive a positioning request from said location
based service client for said subscriber, said request
35   including said alias identity for said subscriber,

look up the subscriber number matching said alias
identity for said subscriber,

perform a positioning request for said mobile
terminal in an associated network,

5   send a response including location information
received from said network and said alias identity to said
location based service client.

An advantage of the invention is that the method is
transparent to the LCS Client so that no business

10   relationship or technical relationship concerning the
anonymity is required between the LCS client and the
network operator.

Brief description of the drawings

15   For a better understanding of the present invention
and in order to show how the same may be carried into
effect reference will now be made to the accompanying
drawings, in which:

FIG 1A illustrates an example of a communication

20   network configuration including a first embodiment of the
system according to the invention,

FIGs 1B and 1C is a flowchart of a first embodiment
of the method according to the invention,

FIG 2A illustrates another example of a communication

25   network configuration including a second embodiment of the
system according to the invention, and

FIG 2B is a flowchart of a second embodiment of the
method according to the invention.

Detailed description of the invention

30   The present invention provide a positioning method
and system wherein a location based service client (LCS-C),
which is outside the control of a mobile network operator,
knows an identifier for a first user A with a mobile radio
terminal and/or a second user B with a second mobile radio

35   terminal, so that the service can take place. The LCS-

Client is, however, unable to determine the real identity
of the user (A and/or B), for example the MSISDN number.

Referring now to the drawings, wherein like or
similar elements are designated with identical reference
5   numerals, there are block diagrams and flowcharts including
signalling depicting the method according to the invention.
The purpose of these diagrams are to illustrate the
features of the invention and the basic principles of
operation of embodiments thereof. It should also be
10 emphasised that the terms "comprises" and "comprising" when
used in this specification is taken to specify the presence
of stated features, integers, steps or components but does
not preclude the presence or addition of one or more other
features, integers, steps, components or groups thereof.

15   FIG 1A illustrates an example of a communication
network configuration including a first embodiment of the
system according to the invention, adapted to protect the
integrity of a first subscriber 1a and/or a second
subscriber 2a, wherein the first subscriber 1a requests the
20 position of a second subscriber 2a located in a network 3
when the subscriber 1a is utilizing a location based
service (LCS). In this exemplary embodiment the first
subscriber 1a has a first portable radio communication
equipment 1b and the second subscriber 2a has a second
25 portable radio communication equipment 2b.

The term portable radio communication equipment,
which herein after is referred to as a mobile radio
terminal or mobile terminal includes but is not limited to
all equipment such as mobile telephones, pagers,
30 communicators, electronic organizers, smart phones or the
like.

Although the first subscriber 1a requests for the
position of the second subscriber 2a it is the position of
the mobile radio terminal 2b that is determined. It is not
35 necessary that neither the first nor the second mobile

radio terminal 1a or 1b is currently used by the
subscriber, but by another user (A or B). In a case when
the requesting user A is different from the requested user
B, the request can be made from a fixed equipment.

5   The system according to the invention comprises a
Gateway Mobile Location Centre (GMLC) 4. In one embodiment
of the invention, the GMLC 4 is a system that comprises at
least a computer processor or other processing component
and a data store operatively connected to the processing

10   component.
          The GMLC 4 is the link between the PLMN (Public Land
Mobile Network) 3 and location services clients (LCS-C) 5.
Generally, the GMLC receives positioning requests, performs
the necessary authentication, initiates the positioning in

15   the PLMN, and sends back the positioning information to the
requesting application.
          The GMLC and a Serving Mobile Location Centre (SMLC)
(not shown), or GMLC alone, - which collects position
information form the communications network and calculates

20   the co-ordinates to be used by the application - allows
authorized applications, provided by the operator or third
parties, to locate a mobile radio terminal using a variety
of methods.
          An IN service (gsmSCP) together with the GMLC are

25   adapted to implement and support anonymous and pseudonymous
identities according to the invention. Hence, no additional
network node is required.
          The GMLC 4 is the GSM/UMTS PLMN node to be accessed
by an external location services client (LCS-C) 5 when it

30   requests the location of a certain mobile station. The GMLC
4 offers interfaces, http in this embodiment, through which
the LCS-C 5 and the GMLC 4 communicates, for example over
an IP network, i.e. the Internet. The communication
includes positioning requests from the LCS-C 5 and

35   positioning answers from the GMLC 4. Moreover, the GMLC 4

performs, among other things, an authorization check on the request.

There are a number of different scenarios where anonymity of the user's identity is required. The different

5   scenarios require different handling of the anonymity. The embodiments disclosed herein relates to the telecom domain access (voice/sms/mms) and utilizes IN technology but is not limited thereto. The method as such does not require IN but is the most efficient solution in terms of

10   implementation cost.

The GMLC 4 also interfaces a gsmSCP (gsm Service Control Point) 6. In one embodiment the CS1+ protocol is used to interface the gsmSCP. This protocol is developed by the applicant and is an extension to ETSI Capability Set 1

15   (CS1). The invention is however not limited thereto and, for example, CAMEL in release 5 of 3gpp is applicable as well.

Basic operations for the communication between GMLC 4 and gsmSCP 6 are needed to handle aliases and outlined in

20   the table below.

Request	Response	Comment
Get_Alias () Requested msisdn, Requester msisdn, ClientId	Ack Alias () aliasID for requested msisdn, aliasID for requester msisdn	To create or get an anonym or pseudonym alias. The new aliasID is sent back in an ack.
Get Identity () Requested _alias Requester_alias	Ack_Identity () Requested trueID Requester trueID	To get the true identity, e.g. MSISDN for an alias. The true identity is sent back in the ack.

IN services is used and dedicated number(s) are set

up in an MSC (Mobile Service Switching Centre) 7. When an
SMS (Short Message Service) arrives at these numbers a
gsmSSF (gsm Service Switching Function)/gsmSRF (gsm Service
Resource Function) 8 of the MSC 7 is triggered and routes

5   the positioning request to the gsmSCP 8. The gsmSCP 6
extracts the requested and requesting number and forwards
these to the GMLC 4. An SIS module 10 in the GMLC 4 is
adapted to assign alias identities for the requesting
and/or requested user and the flow is reversed. The GMLC

10   assign alias Ids and the flow is reversed.
        When assigning the IDs there is a distinction between
anonymous and pseudonymous IDs so that it can be determined
which one is what.
        The GMLC keeps track of which alias that belongs to

15   which MSID. The mapping between the true identity, MSID,
and alias ID are stored persistent in the GMLC as long as
necessary. The durability depends on if it is an anonymous
or pseudonymous alias and for how long time it is necessary
to keep it stored to sustain the services of operation,

20   billing etc.
        An anonymous id and/or pseudonymous id are stored in
the GMLC for basic ID substitution services and are
assigned for requesting and requested subscriber.
        The IDs are preferably in a format that can not be

25   mistaken for a true MSID, e.g. an MSISDN number, and it
shall preferably not be reversible to its true identity by
means of knowing a certain algorithm.   '
        With further reference to FIG 1A, the SMS-C 9 is
provided for SMS communication between the LCS-C 5 and the

30   MSC 7.
        Although, only one or two instances of each entity 1-
10 are shown on the drawings, this is only for the purpose
of illustration. It is however obvious for the skilled man
that the system can comprise a number, not necessary the

35   same number, of entities 1-10 within the scope of the

invention. For example, in an alternative embodiment of the
system configuration at least one GMLC 4 among a number of
GMLCs is adapted to handle connections from multiple LCS-C
clients 5 simultaneously.

5   In a first embodiment of the method according to the
invention illustrated by the flowchart in FIGs 1B and 1C,
an SMS request is sent from User A to a dedicated phone
number for positioning (office based IN triggering) in step
101. The SMS contains the number of a User B that the User

10   A intends to locate. This number is the User B's real
number (but it could be User B's alias as well). In an
alternative embodiment User A has to send the User B number
separately instead of including it in the SMS. A request is
sent to the gsmSCP 6 in step 102 to get an anonymity number

15   or alias identity for either User A, User B, or both. In
this exemplary embodiment the User A and User B are
different users and thus alias identities are created. In
an alternative embodiment aliases are created also in the
case where a single user wants to position himself. The

20   gsmSCP 6 forwards this request in step 103 to an SIS
(Subscriber Identity Server) 10 in the GMLC 4 to retrieve
the actual alias identity in step 104. The SIS 10 is
located in the GMLC 4 in this embodiment.

          The SIS 10 answers the request with an alias identity
25   in step 105 and the gsmSCP 6 replaces the real numbers of
User A and User B with the alias identities in step 106,
and sends a message including the alias back to the gsmSSF
8 in the MSC 7 in step 107.

          The MSC 7 forwards the positioning request to the
30   SMS-C 9 with the alias identity in step 108. In the next
step 109 the SMS-C 9 forwards the request to the correct
LCS-C 5, i.e the LCS that provides the current serivce. The
LCS-C generates positioning request in step 110 and sends
it to the GMLC 4 in step 111. The GMLC 4 looks up the

35   number matching the alias identity in step 112 and a mobile

terminating positioning request for User B is performed in
the network 3, in step 113.

     The GMLC 4 generates billing records as well as logs
alias used for each user in step 114.

5   A response message with location information is sent
to the LCS-C 5 from the GMLC 4, using the alias identity,
in step 115. The LCS-C 5 sends a new SMS to the SMS-C 9
including the location information to the alias identity of
User A in step 116. The SMS-C 9 sends the SMS to the MSC 7,
10   with the alias identity in step 117. The MSC 7 recognizes
the alias identity in step 118 and forwards the SMS to the
gsmSCP 6 in step 119. A request is sent from the gsmSCP 6
to the GMLC 4 in step 120 for decoding the alias identities
in step 121. The decoded alias identities is returned to
15   the gsmSCP 6 in step 122.

     After this step the alias identity could be reused in
subsequent positioning processes for the particular users.

     The gsmSCP 6 replaces the alias identities with the
real numbers in step 123 and sends the SMS to the gsmSSF 8
20   in step 124. Then, the SMS is sent to the User A in step
125. The user can for example read the position on the
display of its mobile radio terminal or use the received
position information in an optional way.

     FIG 2A illustrates another example of a communication
25   network configuration including a second embodiment of the
system according to the invention, which provides the
method of protecting the integrity of a first subscriber
21a or User A requesting the position of a second
subscriber 22a or User B located in a network 23 when
30   utilizing location based services (LCS) via an LCS-client.
User A has a first portable radio terminal 21b and User B
has a second portable radio terminal 22b.

     As an alternative embodiment a positioning request
needs not to be initiated by a subscriber, but can also be
35   initiated by another entity, for example a service on the

Internet or by the network itself (so called network
induced location request).

The system configuration comprises a Gateway Mobile
Location Centre (GMLC) 24. In one embodiment of the
5   invention, the GMLC 24 is a system that comprises at least
a computer processor or other processing component and a
data store operatively connected to the processing
component.

The GMLC 24 is the GSM/UMTS PLMN (Public Land Mobile
10   Network) node to be accessed by an external location
service (LCS-C) client 25 when it requests the location of
a certain mobile station. The GMLC 24 offers interfaces,
through which the LCS client 25 and the GMLC 24
communicates, for example over an IP network, i.e. the
15   Internet. The communication includes positioning requests
from the LCS-C 25 and positioning answers from the GMLC 24.
Moreover, the GMLC 24 performs, among other things, an
authorization check on the request.

The GMLC 24 is adapted to assign alias identities to
20   both requesting and requested parties. Further, the GMLC 24
has an interface to a gsmSCP 26.

IN services is used and dedicated number(s) are set
up in an MSC 27 and when a voice call arrives at these
numbers a gsmSSF/gsmSRF 28 is triggered and routes the
25   positioning request to the gsmSCP 26. The gsmSCP 26 is
adapted to extract the requested and requesting number and
forward these to the GMLC 24. An SIS module 29 in the GMLC
24 is adapted to assign alias identities for the requesting
and/or requested user and the flow is reversed.

30   User A makes a positioning call to a dedicated phone
number in step 201. This number is the number of user B
with a prefix which indicate to the MSC that it is a
positioning request so that the call is forwarded. The call
is then forwarded to the gsmSCP 26 in step 202 for
35   retrieving the alias identity. The gsmSCP 26 requests alias

identities for User A and/or User B in step 203. Optionally
a dedicated number without prefix could be used and user A
gets a voice prompt to input the number for the user B that
User A wants to position. The GMLC 24 retrieves the alias

5   identity or identities in step 204 and returns it or them
to the gsmSCP 26 in step 205.

    The gsmSCP 26 replaces the User A and/or user B
number with the alias identity or identities in step 206
and sends a message including said identity or identities

10   to the gsmSSF 28 of the MSC 27 in step 207.

    The request is diverted by the MSC 27 to a Call
Center/IVR 30 in step 208. After the call has been accepted
by the Call Center in step 209 a positioning request is
sent to the LCS Client 25 in step 210. The LCS Client 25

15   generates a location request in step 211 and sends it
towards the GMLC 24 in step 212.
In a next step 213 the GMLC looks up the number matching
the alias identity.

    A mobile terminating positioning request is performed

20   in the network, for User B in a next step 214.
The GMLC can generate billing records as well as logging
which alias was used for which user in step 215.

    A response with the location is sent to the LCS
Client 25 from the GMLC 24, using the alias identity, in

25   step 216. After this step the alias identity could be
reused in subsequent positioning requests.

    The position is reported to the Call Center/IVR 30 in
step 217 and the User A gets the position information from
a telephone operator or IVR on existing voice route via the

30   MSC 27 in step 218.

    An anonymous identity is only valid for one request,
and therefore the E.164 numbers used for aliases can be
reused. A pseudonymous identity can be used by the same
subscriber for many subsequent requests. The true identity

35   of the subscriber is only known by the operator for both

types of request.

For the SMS and Voice scenarios the anonymity service in the GMLC is adapted to receive requests from a gsmSCP. This request contains the identifications for requested

5   and/or requesting user. The anonymity service assigns alias ID(s) and sends the result back. This works in an inter-GMLC roaming and the 3GPP specified roaming situation.

The method and system of protecting the integrity of subscribers utilizing location based services (LCS) via an

10 LCS-client used in a process of positioning a mobile terminal, with respect to both the subscriber requesting a positioning of the mobile terminal and a subscriber of the mobile terminal to be positioned, provides anonymity or pseudonymity by replacement of identities with alias

15 identities according to the invention. Anonymity and pseudonymity means that requesting and/or requested parties (B) are able to use positioning services or be positioned without revealing their true identity to the LCS-Client involved in the positioning process. When alias identities

20 are used, the method is able to assign alias identities for requesting and/or requested parties.

Although the invention has been described in conjunction with SMS and voice communication it is equally applicable for MMS. The two example embodiments of the

25 system and method according to the invention have been described separately for illustration purposes. However, in a third embodiment the two systems are integrated forming a system adapted to, but is not limited to, perform the methods of at least the first and second embodiment of the

30 method according to the invention. In this third embodiment the GMLC, gsmSCP, and the MSC are adapted to handle at least SMS and voice communications according to the above described first and second embodiments of the method.